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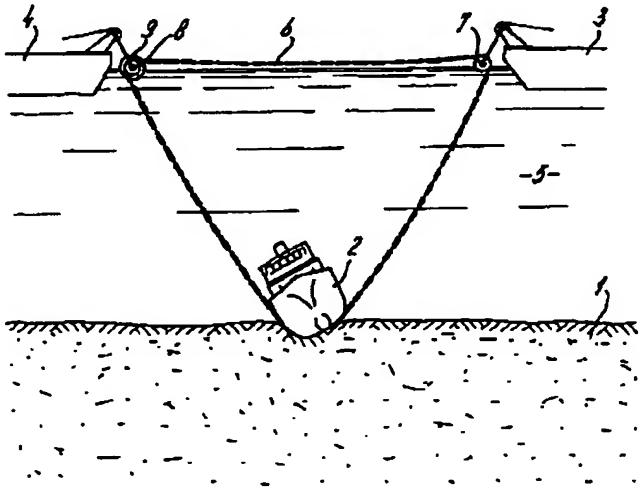
(54) Title: CHAIN FOR SAWING THROUGH AN OBJECT, SUCH AS AN OBJECT LOCATED IN OR ON THE WATER, AND SAWING INSTALLATION PROVIDED WITH SUCH A CHAIN



(57) Abstract: The invention relates to a chain for sawing through an object, in particular an object located in or on the water, such as a ship, drilling platform, bridge, pipeline, etc. The chain is a link chain. The links are provided with a machining surface coating. Said machining surface coating can comprise grit grains, in particular hard metal grit grains. The grit grains can have a size in the range from 4 to 10 mm and can be applied to the links by hard soldering. In particular, each link can consist of two U-shaped end parts with, between them, a body having a peripheral surface with the machine surface coating running in the longitudinal direction of the link concerned. The invention further relates to a sawing installation for sawing through an object located in or on the water, in which installation amongst other things a chain according to the invention is used.

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Chain for sawing through an object, such as an object located in or on the water, and sawing installation provided with such a chain.

The present invention relates to a chain for sawing through an object, in particular an object located in or on the water, such as a ship, drilling platform, bridge, pipeline, etc., the chain being a link chain with links that hook transversely into one another. The chain according to the invention can, however, also be used on land, for example for sawing through a building or part of a building or some other object.

The object to be sawn through using the chain according to the invention will in general be made of stone and/or concrete and/or metal, such as steel.

A chain of this type is known. According to the prior art, for the purposes of salvage a shipwreck lying on the sea bed is usually sawn into pieces by passing an ordinary ship's chain or anchor chain beneath the ship and the two ends of the chain are usually alternately pulled in and paid out from a derrick above water. The chain is then, as it were, laid in a U-shaped loop and is pulled, or to put it more accurately heaved, back and forth exerting forces of many tonnes. With this procedure sawing through the shipwreck is based on mechanical force; the ship is pulverised or broken at the point of contact with the chain. With this procedure it is customary to saw the ship into a number of parts, the saw cuts being transverse, vertical cuts through the shipwreck. Sawing part of a shipwreck free in this way usually takes one to several days. This method of sawing through is thus very time-intensive. Another significant disadvantage of sawing through a ship in this way is that, as already stated, very high forces are needed for this, which places very severe and adverse stresses on the derrick from where the chain is heaved back and forth, which thus can lead to damage to the derrick. Yet a further disadvantage is that only vertical saw cuts are possible using the sawing method according to the prior art.

More generally, the following can be pointed out with regard to the prior art:

- A chainsaw with which the links are provided, directly or via intermediate pieces, with saw teeth attached thereto is known from forestry and related fields. See, for example, US 3 192 973, US 4 518 022 and US 4 258 763.
- A chainsaw for shipwrecks appears to be disclosed in SU 757 391. The chain appears to be a sort of ordinary bicycle chain – that is to say it is not of the link type –, which is provided with cutting/sawing teeth. This saw chain has the

major disadvantage that it is very expensive and requires a very specific orientation with respect to the shipwreck to be sawn if it is to be able to saw.

- The use of grit in machining tools, and possibly even for sawing, is known from various sources.
- The use of diamond as a machining material for machining tools, possibly even for sawing, is also known. However, diamond cannot be used when sawing shipwrecks because as a consequence of the generation of heat when sawing steel, which also occurs underwater, the diamond lattice collapses to return to an ordinary carbon lattice and is then therefore no longer effective.

The aim of the present invention is to provide an improved chain of the type indicated in the preamble, which chain preferably also overcomes the abovementioned disadvantages.

The abovementioned aim is achieved according to the invention in that the links are provided with a machining surface coating, such as a chipping surface coating. By providing the links with a machining surface coating, sawing through the shipwreck or some other object will take place by means of a machining action, such as a chipping action, that is to say partially to largely by a machining action instead of the traditionally known sawing through by what is in fact nothing more than pulverisation, which demands a great deal of force and takes a great deal of time. Non-vertical, such as horizontal or sloping, saw cuts are also possible with the chain according to the invention.

According to the invention, a machining surface coating can be produced particularly well by providing the links with a surface coating containing grit , such as grit consisting of hard metal, cermet, ceramic material or mixtures thereof. Grit grains, in particular hard metal grit grains, are relatively hard and have a good machining action. Hard metals, ceramics and cermets are well known in the prior art and have good wear characteristics so that they are used for example as cutting tools. Hard metals, ceramics and cermets in the form of grit also have a good machining action. Hard metals essentially comprise a hard phase of carbides, nitrides and/or borides of one or more of the elements of the IVa-, Va- oder VIa-group of the Periodic System and a binder of the iron group, preferably of Co and/or Ni. Cermets essentially comprise a hard phase which main part consists of a carbonitride of the aforesaid metals. The composition essentially comprises carbides, nitrides, carbonitrides, carbooxinitrides and/or borides of one or more of the elements of the IVa-, Va- oder VIa-group of the Periodic System and a binder of the iron group of the

Periodic System, preferably Co and/or Ni. Furthermore also ceramics are known as wear resistant against abrasion and/or corrosion.

The grit can be produced by crushing hard metal-, ceramic- or cermet-bodies, including worn cutting tools of hard metal (or sintered carbides), cermets and ceramics, especially for cutting metals, said tools can be uncoated or coated with a layer applied by physical vapour deposition or chemical vapour deposition. Examples for hard metal-, ceramic- or cermet-bodies and the coatings are described in Metall, 45. Jg. Heft 3, March 1991, pages 224-235. These bodies can be shreddered or otherwise crushed to grains, whereafter this grit, especially as an unsorted mixture of the aforesaid materials, can be mixed with suitable brazing materials or other granular additives of hard metals, cermets, ceramics or mixtures thereof. After heating this mixture above the melting point of the brazing material and cooling down this solution to room temperature, you can get a solid bar, wherein a relative dense package of the grits is fixed by the brazing material which fills up the interspaces between the grits. Heating this bar above the melting temperature of the brazing material, but lower than the melting temperature of the grit makes it possible to deposite a layer onto a chain or parts of the chain. The minimum thickness of this layer is determined by the grain size of the grit. When cooling this surface layer the brazing material hardens. It is also possible to deposite one or more layers of grit embedded in the brazing material. Suitable brazer consist preferably of copper, tin and zinc. The brazer can optionally comprise additives like Al and/or Ag.

As partly aforementioned the grit can be produced by crushing worn hard metal- and/or cermet- and/or ceramic-tools, sieving the crushed grit-mixture to limit the greatest grain size to a maximum diameter which should be preferably less than 6 mm and covering the outer surface of the chain or parts thereof with a dense layer of grits by brazing. The layer thickness (of a single layer) is than about 4 mm to 6 mm whereby advantageously grit-tips can protrude out of the surrounding brazer-surface.

In a further embodiment of the invention two grit-layers embedded in brazer can be applied to the chain or the chain parts to be covered. The total thickness of these two layers is then preferably between 6 mm and 12 mm.

With respect to the grain size Applicant has found more general, that the grit grains can have a grain size of 3 to 18 mm, particularly good results being obtained with grit grains having a grain size in the range from 4 to 10 mm. In this context it should be clear that the grit grains do not all have to have an identical grain size, but that, rather than this,

this grain size will vary. In this context it is also pointed out that the machining surface coating can also contain grit grains which have a grain size lying outside the said ranges. However, the Applicant has found that grains within the said ranges contribute to the machining action particularly well. In particular, according to the invention the average grain size of the grit grains will be within the abovementioned ranges.

According to the invention, the grit grains can be applied relatively simply and effectively by fixing these to the links by means of hard soldering.

According to a particularly preferred embodiment of the invention, each link consists of two U-shaped end parts with, between them, a body having a peripheral surface which runs in the longitudinal direction of the link concerned, on which peripheral surface the machining surface coating has been applied, wherein said peripheral surfaces of the links together define a surface extending in essentially tubular form in the longitudinal direction of the chain. What is achieved in this way is that it is possible to saw with the chain in a relatively regular manner. Specifically, such an embodiment prevents the chain being subjected to rotations about the longitudinal axis of the chain each time a join between successive links passes over a resistance point. This appreciably benefits smooth running of the chain during sawing. In particular, this also makes it possible appreciably to reduce the forces needed for sawing and for the chain to be fed round as an endless chain in one direction of rotation, that is to say clockwise or anticlockwise.

In order to prevent a preferred orientation of the chain during sawing, it is preferable according to the invention if the essentially tubular surface is of circular cross-section. This counteracts certain zones of the machining surface coating always being subjected to greater stress than other zones during sawing.

According to a preferred embodiment of the invention, each link comprises an oval, annular chain link and each body comprises two shell parts, the two parts being fixed to the chain link from opposing flat sides of the chain link, for example by welding them thereto. A conventional anchor chain, ship's chain or other type of chain can be taken as the chain and can be converted to a chain according to the invention by fitting two shell parts, with the machining surface coating thereon, on each chain link.

A preferred embodiment of the inventive chain has chain links connected with shells as carriers for the aforedescribed coatings. Two shells can be welded with the link, whereafter the entire body consisting of the link and the two shells is wholly or partly covered with a brazed layer of grits. This has the advantage, that both the shells and the

links obtain a machining action and are wear protected as well. If the shells are welded with the links, they can, when worn, be covered again in a manner that the brazing temperature for applying the grit is lower than the melting temperature of the welding material which connects the shells and the links.

In order to fix both shell parts firmly to the chain links, it is preferable according to the invention, as a supplement to welding the shell parts, or instead of the latter, if a plate with a first bolt hole is fixed in each chain link, for example by welding, if the shell parts are each provided with a second bolt hole which is in line with the first bolt hole and if the second bolt holes are widened at an opening in the peripheral surface to accommodate the head of a bolt or of a nut fitting on the bolt and if a bolt extends through the bolt hole, which bolt, together with a nut, fixes the shell parts to the chain link. With such a construction it is possible to replace the shell parts if these are worn or to replace them for a specific task by shell parts better equipped for that task and having, for example, a somewhat different type of machining surface coating. After cutting operation, when the shells are worn, the shells can, after detaching from the links, also be covered again with one or more layers so that the shells can be reused more than once.

According to the invention it is also very well possible for each body to be produced in one piece and preferably to be tubular, and for the U-shaped end parts to be fixed to opposing ends of the body, preferably by butt-welding. Such an embodiment requires fewer components and consequently, from the structural standpoint, will be less expensive to produce.

In a chain according to the invention the links can have a length of at least 15 cm, preferably 30 cm or more and/or the links can have a thickness of at least 2 cm, preferably 3 cm or more.

According to a further aspect, the invention relates to a sawing installation for sawing through an object located in or on the water, such as a ship, drilling platform, bridge, pipeline, etc., comprising:

- a chain according to the invention which is constructed as an endless chain or at least can be joined to form an endless chain;
- at least two return wheel guides for guiding the chain round a bend; and
- at least one drive for making the chain run round continuously in one direction;

wherein the return wheel guides can preferably be positioned essentially at an arbitrary distance from one another.

Using a sawing installation of this type it is possible, according to the invention, to saw completely through a shipwreck using relatively little force within a relatively short time. For an average shipwreck, for which approximately one day per saw cut was needed with the sawing method according to the prior art described in the preamble, a few hours, and usually even only one to two hours, are needed per saw cut with a sawing installation according to the present invention. According to a particular embodiment, the sawing installation according to the invention comprises one vessel or two vessels, one of the return wheels being provided per vessel. However, it should also be clear that the return wheels can also both be provided onshore if the circumstances indicate this. It is also conceivable for one return wheel to be provided onshore and for the other return wheel to be provided on a vessel. It is also very readily conceivable to position one or more return wheels on the sea bed, or at least to anchor them thereto. It is also pointed out that one or both return wheels can be driven in order to cause the chain to run round.

The present invention will be explained in more detail below with reference to an illustrative embodiment shown diagrammatically in the drawing. In the drawing:

Fig. 1 shows, diagrammatically, a first sawing installation according to the invention, a chain according to the invention and the use thereof;

Fig. 2 shows a number of links of a chain according to the invention, links of two different types being shown;

Fig. 3 shows a more detailed view of one of the link types from the chain section according to Fig. 2;

Fig. 4 shows a perspective view with the components of a link as shown in Fig. 3 taken apart;

Fig. 5 shows, diagrammatically, a second sawing installation according to the invention, a chain according to the invention and the use thereof;

Figs 6A and 6B show, respectively, a cross-sectional view and a longitudinal view of a further embodiment of a link for a chain according to the invention, and

Fig 7 shows a perspective view of yet a further embodiment of a link for a chain according to the invention.

Fig. 1 shows, diagrammatically, and certainly not with the correct size relationships, a shipwreck 2 lying on the sea bed 1 and two vessels 3 and 4 on the surface of the sea 5. Fig. 1 also shows, diagrammatically, a sawing installation according to the invention, which sawing installation comprises an endless link chain 6 according to the invention, a

first return wheel guide 7, a second return wheel guide 8 and a drive 9 acting on the left-hand return wheel guide 8 for running the endless chain 6 round in the clockwise direction or in the anticlockwise direction.

The return wheel guides 7 and 8 and the drive 9 are attached to the vessels 3 and 4, respectively, in some way or other. In Fig. 1 this method of fixing is indicated diagrammatically only by way of example. It should, for example, be clear that it is also very readily possible to mount the return wheel guides 7, 8 and drive 9 directly on the ship or in the ship's hull instead of on a jib construction and then to provide an opening for the chain 6 in the ship's hull. According to the invention it is also very readily conceivable that one or both return wheel guides 7, 8, and optionally the drives 9, are set up onshore if the circumstances demand this or make it possible.

As is customary per se from the prior art in the case of conventional sawing with normal chains, the chain 6 will first be pushed through beneath the shipwreck 2 that is lying on the bed 1 of the sea 5. To this end, the chain 6, that is endless during sawing, will in general initially be open, in the sense that it does not yet form a closed loop but is a long length of chain. Using the chain pushed through beneath the ship in this way, it is possible – see Figure 5 – to saw moving back and forth in a conventional manner, by moving the two ends up and down (double-headed arrows 50) from a pontoon or vessel 3,4. However, the speed of movement of the chain will in this case be greater than 1 m/sec, whilst conventionally this is less than 1 m/minute. Departing from the conventional, according to the invention it is advantageous in this case if chain guides 51, such as return wheels, are provided at the bed 1 on either side of the shipwreck, which chain guides can be fixed to the bed 1 by means of anchors 52, such as so-called suction anchors. Since the entire chain does not have a sawing action when sawing up and down (double-headed arrows 50), in the case of the installation and method according to Figure 5 it will be possible for a chain which is provided with the machining surface coating only on that portion that is located close to the bed to suffice. This portion will have a length of at least the sum of the horizontal width of the saw cut and once, preferably twice, the stroke executed by the chain on sawing up and down. The remaining portions of the chain 6 can optionally also be replaced by a cable or cable-like body since they do not have a sawing action. In the case of the chain according to the invention, bed guides 51 are not necessarily needed when sawing up and down (Figure 5). However, these have the advantage that the forces required for moving the chain up and down are lower.

To return to Figure 1, it is, however, possible after pushing the chain 6 through beneath the shipwreck 2 to close this chain (as shown in Figure 1) to produce an endless loop, for example by means of a coupling link that can be uncoupled or by welding the last link in place, as is customary and is known from the prior art for the production of such a chain.

In order to saw through the shipwreck 2, in the examples shown in figures 1 and 5, along an essentially vertical saw cut face, the chain 6 will be rotated in one direction respectively moved to and fro at a speed of, in particular, greater than or equal to 1 m/sec. In use, the machining action of the chain according to the invention creates chips having a chip length of some milimeters. In the case of an ordinary ship's chain or anchor chain this will as far as possible not result, or barely result, in a sawing effect unless extremely large forces are exerted to drive the chain round, in which case, however, it will then not be sawing by machining that takes place, but sawing by a sort of pulverisation of the parts of the shipwreck to be sawn through.

By, in accordance with the invention, taking, as chain 6, a link chain having links which hook essentially transversely into one another, the links of which chain are provided with a machining surface coating, machining sawing through of a shipwreck 2 becomes possible in such a way, a considerably lower force being required. Because use is made of a link chain which has a machining coating provided on the surface of the links, it is not absolutely essential to provide guides (such as the guides 51, anchored by anchors 52, in Fig. 5) at the sea bed, and more particularly to the shipwreck, to guide the chain in the correct manner over a shipwreck in order to be able to saw by machining. However, such guides, such as the guides 50 in Fig. 5, can also advantageously be used with the method and installation according to Figure 1 in order to lower the forces required for moving the chain. In principle, it is conceivable to take an ordinary link chain, known from the prior art, for such sawing work and to apply a machining surface coating, for example a surface coating in the form of hard metal grit grains with a grain size of which the average value is in the range from 4 to 10 mm, directly to these links. The links of such a chain essentially consist of elongated loops of very thick wire. It should be clear that the machining surface coating is then applied in particular to those portions of the elongated loops that extend in the longitudinal direction and preferably not to the ends of the loops, since the links could then have a machining effect on one another as a consequence of hooking into one another.

However, according to the invention it is more preferable to construct the links of the

link chain in a manner such as is shown diagrammatically in Figs 2 - 4 and 6 - 7. In Fig. 2 two embodiments are, as it were, shown alongside one another, that is to say the embodiment with the links 10 and the embodiment with the links 20. The embodiment with the links 10 is illustrated diagrammatically in yet more detail in Figs 3 and 4.

The links 10 and 20 have in common that they both consist of two essentially U-shaped end parts 11 and 21, respectively, with, between them, a body 12 and 22, respectively, having a peripheral surface 13 and 23, respectively, running in the longitudinal direction of the link concerned, on which peripheral surface the machining surface coating of grit grains 14 and 24, respectively, is applied. As is indicated in Fig. 3 by dash-and-dot lines, the peripheral surfaces of the links together form an essentially tubular surface extending in the longitudinal direction of the chain. With this arrangement, this essentially tubular surface that is defined by the bodies 12, 22 forms, as it were, the surface having a machining action. As a consequence of the make-up of the chain from links that essentially hook transversely into one another, this surface 30 having a machining action is flexible in, as it were, all directions. This is extremely favourable for the machining sawing action, since, during sawing, the chain is then optionally also able to saw along a curved path transverse to the saw cut. In this way the chain can, as it were, be self-seeking if it encounters a portion that is difficult to saw or less easy to saw, in the sense that the chain can then make a diversion around this point and can seek the route of least resistance. By giving the bodies 12 and 22, respectively, a circular cross-section, viewed transversely to the longitudinal direction of the link, the essentially tubular surface is provided with a circular cross-section. What is achieved in this way is that the chain itself will not have a preferred orientation as far as machining sawing is concerned. Specifically, a preferred orientation could lead to some zones of the tubular surface being subjected to greater stress than others as a consequence of the orientation preference, which is less advantageous for the life of the chains. However, it should be clear that it is also very readily conceivable for the cross-sectional surface of the essentially tubular surface to be chosen to be oval, in which case the machining surface coating could then optionally be provided on one side of the oval peripheral surface, whilst the other side is not provided with a machining surface coating.

The links 20 are made up of two separate U-shaped parts 21 and a central tubular body 22 (that optionally could also be a solid cylinder at the cost of an increase in weight), which parts 21 and 22 are joined to one another by butt welding or in some other way, for

example ordinary welding. As will be explained in more detail with reference to Fig. 4, said butt welding as such is a technique for closing the links that is customary in the production of link chains. A coating of grit grains of a desired and advantageous grain size can then be provided on the external peripheral surface of the body 22 by hard soldering.

With reference in particular to Figs 3 and 4, the link 10 of a chain according to the invention is essentially constructed around a conventional chain link 15, which consists of a curved wire 17 closed by a butt weld 16 to produce an elongated, more or less oval shape. With this arrangement the link 15 has, as it were, two U-shaped end parts 11 with, between them, two essentially straight parts 18. In order to fix two shell parts 41 and 42, forming the body 12, a plate part 19 is welded in the link 15, which plate part 19 is provided with a passage 40. Such a plate part 19 also has the additional advantage that it reinforces the link and thus prevents the straight link parts 18 being pinched together. The shell parts 41 and 42 are placed against the link 15 from opposing flat sides of the link 15 and are each also provided with a bolt hole 43 and 44, respectively, the ends of which, which open onto the peripheral surface of the body 12, being widened, so that the head 45 of bolt 47 and nut 46 can be removably countersunk therein. In order to prevent shifting of the shell parts 41 and 42 along the link 15 under the influence of machining forces, the shell parts are provided with ridges 48, 49 which grip around the transverse ends of the plate 19. This is supplementary to the fixing, which is already achieved by making use of the bolt hole 40 in the plate 19.

A further advantageous embodiment of a link 60 for a chain according to the invention is shown in Figure 6A (cross-section) and Figure 6B (longitudinal view). The link 60 in Figure 6 is to be regarded as a variant of the link 10 in Figures 3 and 4. The link 60 can once again be a conventional chain link 15, which consists of a curved wire 17 closed by means of a butt weld 16 to produce an elongated, more or less oval shape. The link 60 then has, as it were, two U-shaped end parts 11 with, between them, two essentially straight parts 18. In the case of this embodiment also, a plate part 19 can optionally be provided to reinforce the link 60. As can clearly be seen in Figure 6A, the most important difference compared with the link 10 in Figures 3, 4 is that the shell parts 55 are not fixed to the link by means of a bolt construction but are welded thereto by welds 56 running along the straight link parts 18. The welds 56 are preferably on the outward-facing sides of the straight link parts 18 so that, after applying the machining surface coating 53, an approximately flat transition from the one shell part 50 to straight part 18 and to the other

shell part 50 is produced. The shell parts 50 are of curved cross-section, and in particular have a cross-section in the shape of a sector of a circle. The plate part 19 does not require a bolt hole in this embodiment and can optionally also be dispensed with. Furthermore, it is conceivable that the butt weld 16 is dispensed with. The reason for this is that the welded joins with the shell parts 50 and with the plate part 19 that is optionally provided provide the link 60 with adequate strength.

If the butt weld 16 is omitted from the embodiment according to Figure 6, it is also no longer necessary for the link wire 11, 18 to form a closed oval. This results in a further advantageous embodiment, which is shown in Figure 7.

In the embodiment of the link 70 in Figure 7 a gap 72 has been left between the end faces 71 of the link wire 11, 18, which gap 72 makes it possible to hook another link 70 into the link 70 shown before the shell or shell parts 73 is/are provided. This appreciably simplifies the production of the link 70. The shell 73 can be made in one piece and, as it were, be slid over the link wire 11, 18 and then welded thereto – which, incidentally, is also conceivable with the embodiment according to Figures 3, 4 and 6 – but can also be constructed in accordance with the embodiment in Figure 6 and then, therefore, be in two parts. The shell parts 73 can then each have a ridge located in the passage 72, which ridges optionally can be welded to one another.

CLAIMS

1. Chain (6) for sawing through an object, in particular an object (2) located in or on the water, such as a ship, drilling platform, bridge, pipeline, etc., the chain (6) being a link chain with links (10, 20) that hook transversely into one another, characterised in that the links are provided with a machining surface coating (13, 23).

2 Chain (6) according to Claim 1, characterised in that the machining surface coating (13, 23) comprises grit (14, 24), such as grit consisting of hard metals, cermets, ceramics or mixtures thereof. .

3. Chain (6) according to claim 2, characterised in that the hard metal essentially comprises a hard phase of carbides, nitrides and/or borides of one or more of the elements of the IVa-, Va- or VIa-group of the Periodic System and a binder of Co and/or Ni.

4. Chain (6) according to claim 2, characterised in that the cermet essentially comprises a hard phase of carbides, nitrides, carbonitrides, carbooxinitrides and/or borides of one or more of the elements of the IVa-, Va- or VIa-group of the Periodic System and a binder of Co and/or Ni.

5. Chain (6) according to one of the claims 2 - 4, characterised in that the grit is produced by crushing sintered hard metal bodies, ceramic bodies or cermet bodies, including worn tools of these materials, or mixtures thereof, sieving the crushed grit or the gritmixture to limit the greatest grain size to a maximum diameter of 4 mm to 6 mm and covering the outer surface of the chain or parts thereof with a dense layer of grits by brazing, hard soldering or welding.

6. Chain (6) according to one of the preceding claims, characterized in that the machining surface coating on the outer surface of the chain or parts thereof contains one or two layers, each having a thickness $\geq$ 4 mm to 12 mm, preferably $\geq$ 6 mm.

7. Chain according to one of the claims 2-6, characterised in that the grit is applied

by brazing, hard soldering or welding.

8. Chain (6) according to claim 7, characterised in that the brazer consists of copper or of a copper alloy with copper and at least one of the metals tin or zinc, preferably of a copper-tin-zinc alloy.

9. Chain (6) according to claim 8, characterised in that the copper-alloy comprises additives like Al and/or Ag.

10. Chain (6) according to one of the preceding claims, characterised in that the grains of the grit (14, 24) have a grain size in the range from 3 to 18 mm, such as 4 to 10 mm.

11. Chain (6) according to one of the preceding claims, characterised in that each link (10, 20) consists of two U-shaped end parts (11, 21) with, between them, a body (12, 22) having a peripheral surface which runs in the longitudinal direction of the link (13, 23) concerned, on which peripheral surface the machining surface coating has been applied, and in that said peripheral surfaces of the links together define a surface (30) extending in essentially tubular form in the longitudinal direction of the chain.

12. Chain (6) according to Claim 11, characterised in that the essentially tubular surface (30) is of circular cross-section (31) or is n-sided with equal sides, where $n \geq 6$, such as 6, 7 or 8.

13. Chain (6) according to one of the preceding Claims 11 - 12, characterised in that each link comprises an oval, annular chain link (15) and in that each body comprises two shell parts (41, 42), the two parts being fixed, for example welded, to the chain link (15) from opposing flat sides of the chain link.

14. Chain according to claim 13, characterized in that each shell (41, 42) is connected to the link by welding and that thereafter the body consisting of the link and the shells is wholly or partly covered with machining surface coating, suchs as a brazed layer.

15 Chain (6) according to Claim 13 or 14, characterised in that a plate (19) with a first bolt hole (40) is fixed in each chain link (10), in that the shell parts (41, 42) are each provided with a second bolt hole (43, 44) which is in line with the first bolt hole (40) and in that the second bolt holes (43, 44) are widened at an opening in their peripheral surface (13) to accommodate the head (45) of a bolt (47) or of a nut (46) fitting on the bolt and in that a bolt extends through the bolt holes (40, 43, 44), which bolt, together with a nut (46), fixes the shell parts (41, 42) to the chain link (15).

16. Chain according to Claim 11 or 12, characterised in that each body (22) is produced in one piece and is preferably tubular and in that the U-shaped end parts (21) are fixed to the opposing end faces of the body (22), preferably by welding.

17. Chain according to one of the preceding claims, wherein the links:

- have a length of at least 15 cm, preferably 30 cm or more; and/or
- have a thickness of at least 2 cm, preferably 3 cm or more.

18. Sawing installation for sawing through an object that is in the water or on land, comprising a chain according to one of Claims 1 - 17.

19. Sawing installation for sawing through an object (2) located in or on the water, such as a ship, drilling platform, bridge, pipeline, etc., or an object located on land, such as a building, comprising:

- a chain (6) according to one of the preceding claims 1-17 which is constructed as an endless chain or at least can be joined to form an endless chain;
- two return wheel guides (7, 8) for guiding the chain (6) round a bend; and
- at least one drive (9) for making the chain (6) run round continuously in one direction;

wherein the return wheel guides (7, 8) can preferably be positioned essentially at an arbitrary distance from one another.

20. Sawing installation according to Claim 19, further comprising one vessel (3 or 4) or two vessels (3, 4), wherein one of the return wheels (7, 8) is provided per vessel.

21. Sawing installation according to one of Claims 18 - 20, comprising drive means equipped to move the chain in its longitudinal direction at a speed greater than or equal to 1 metre/second.

22. Use of a chain according to one of Claims 1 - 17 or of a sawing installation according to one of Claims 18 - 21 for sawing through an object containing stone and/or concrete and/or metal, such as steel.

****

Fig-1

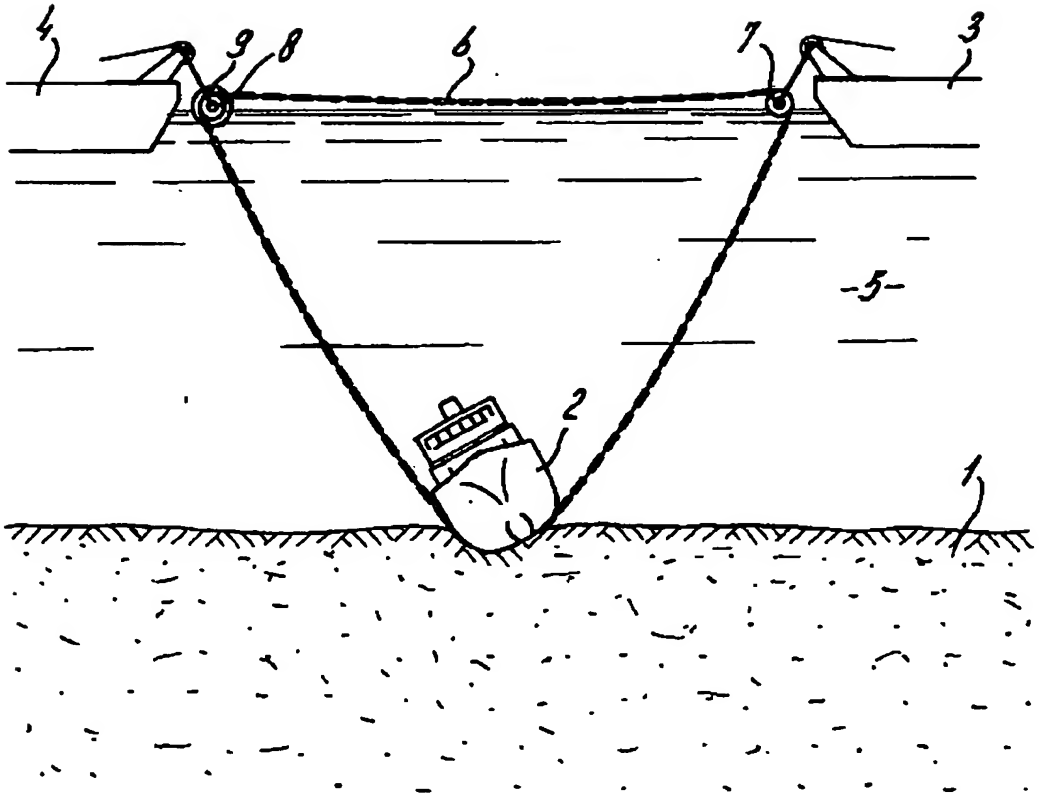


fig-2

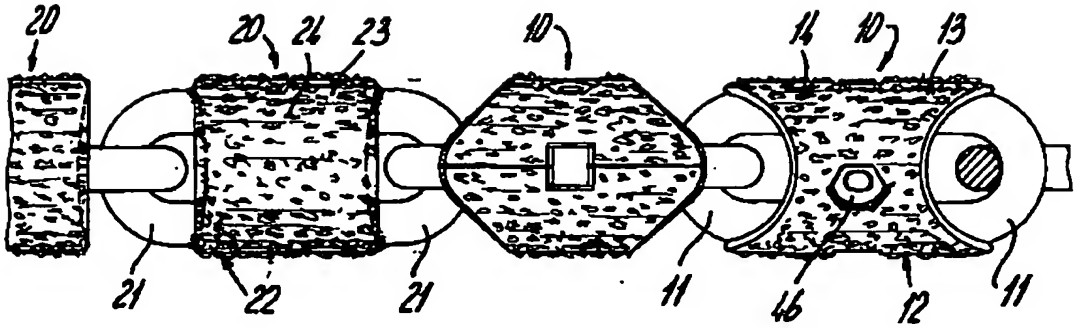


fig-3

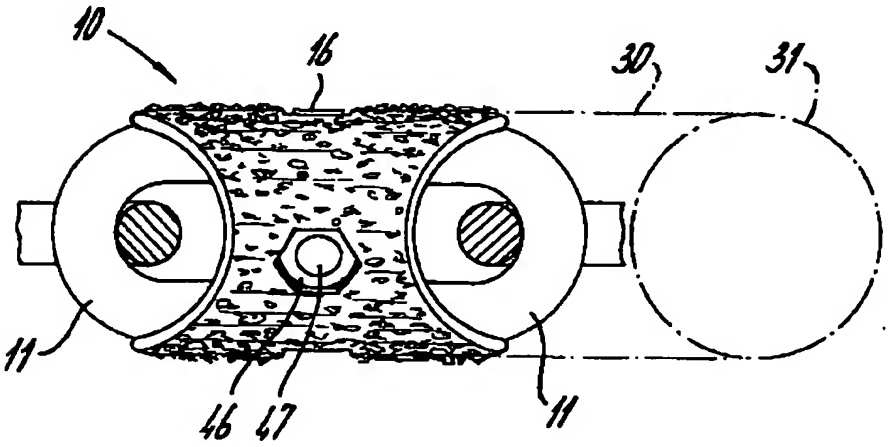


Fig-4

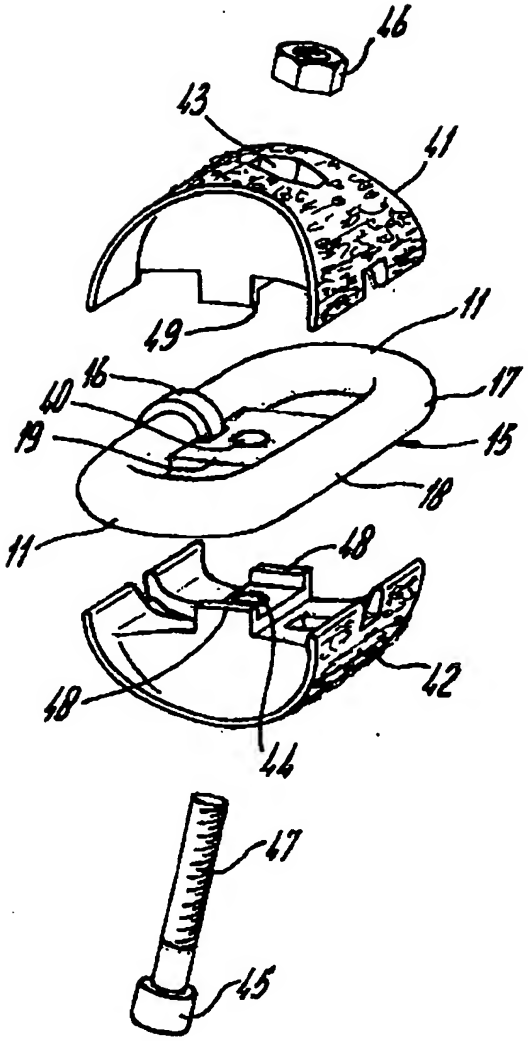


Fig 5

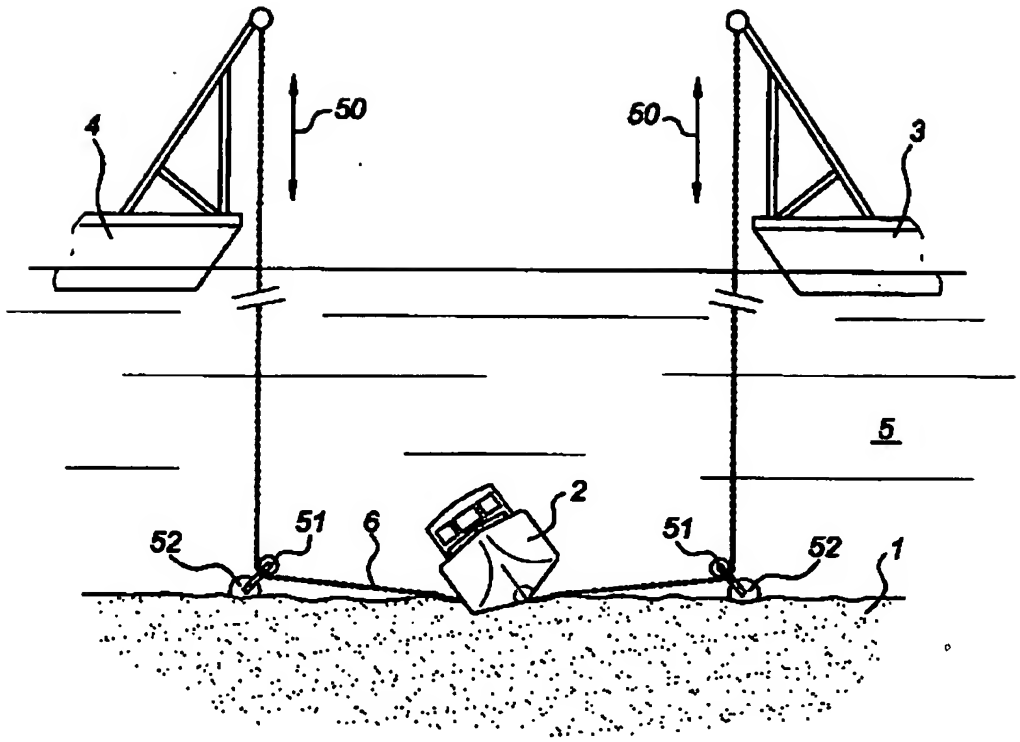


Fig 6a

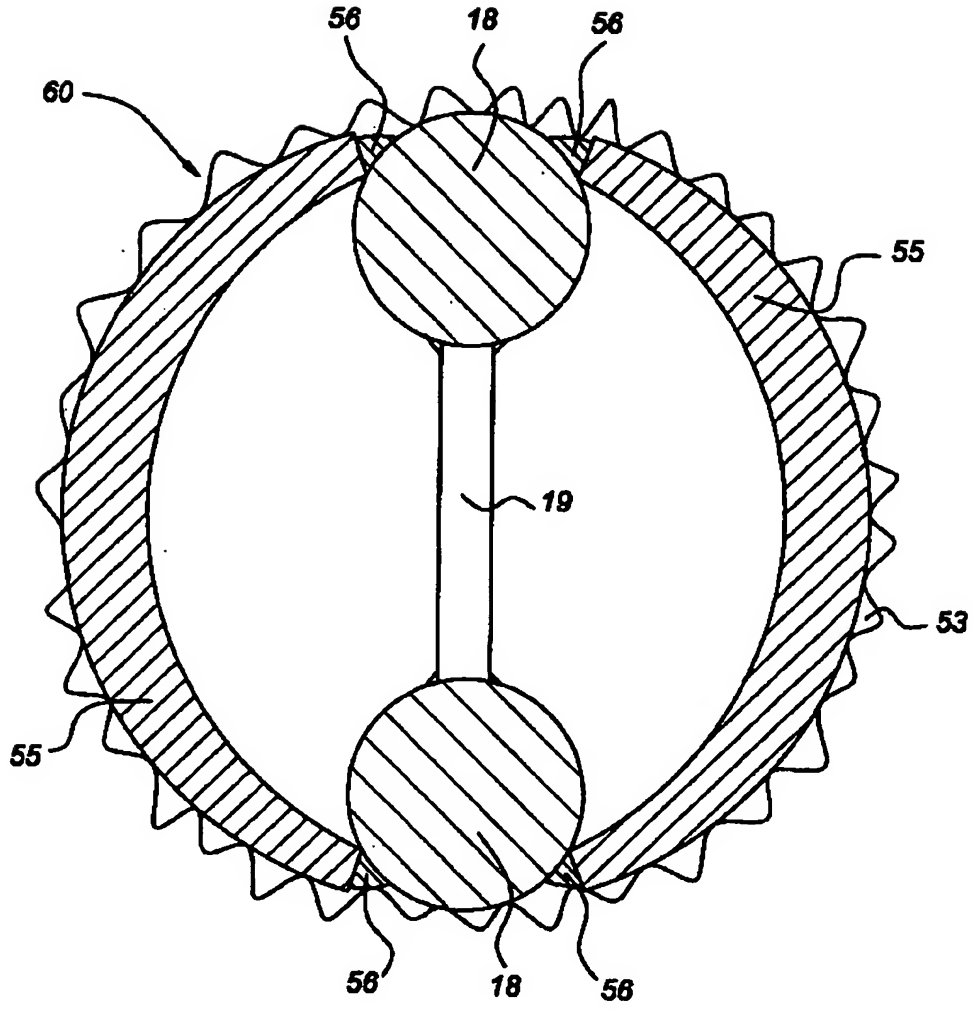


Fig 6b

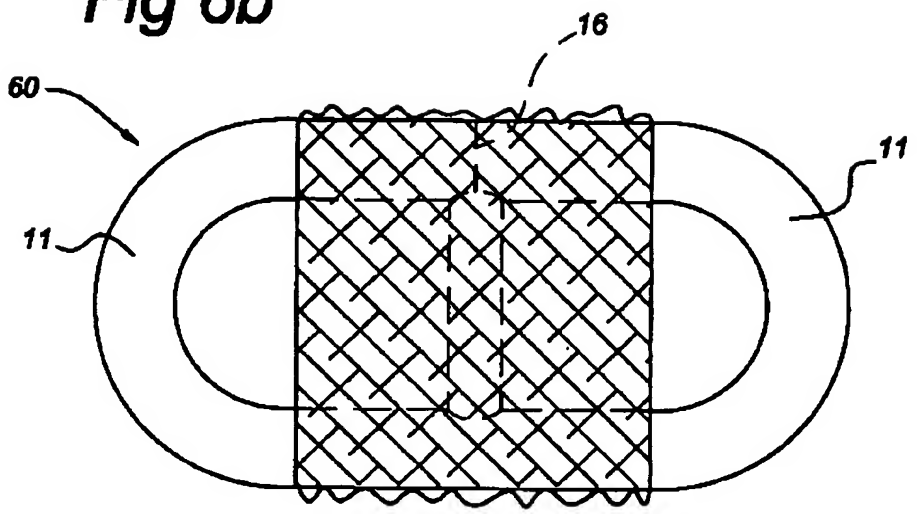
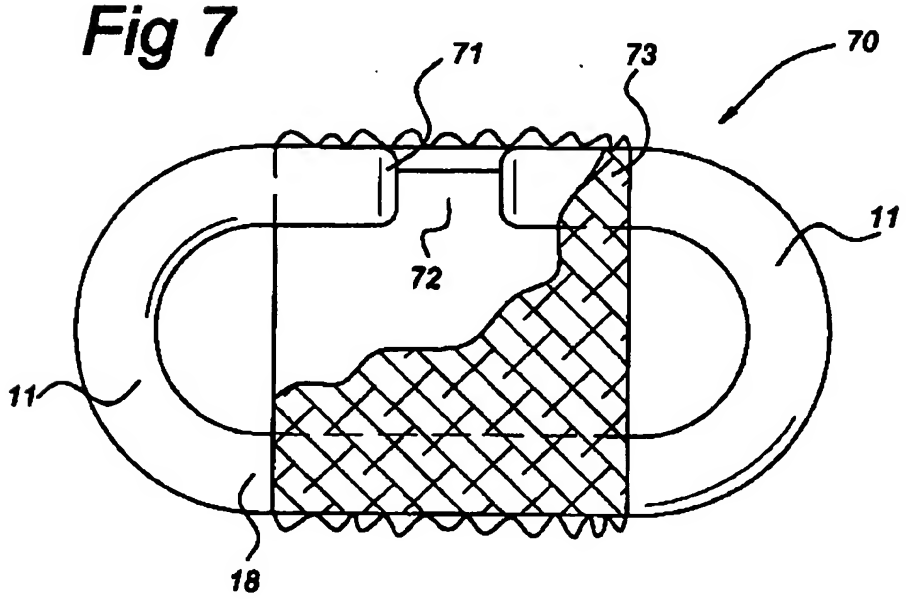


Fig 7



INTERNATIONAL SEARCH REPORT

tional Application No
PCT/NL 01/00280

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B23D57/02 B23D61/18 B63C11/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B23D B28D B63C B63B B27B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A		13,14, 19,22
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2001	06/08/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Rijks, M

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